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ROLLER HAVING SURFACE OF SPONGE RUBBER KNOBS

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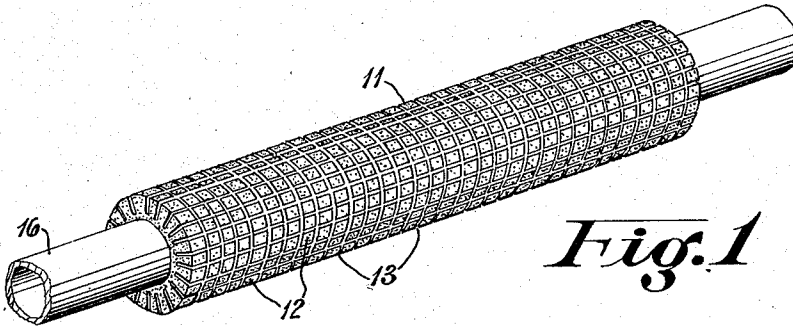


Fig. 1

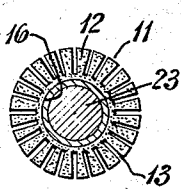


Fig. 2

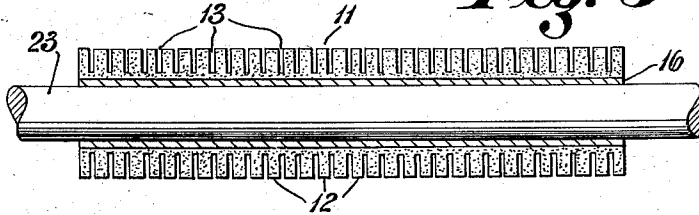


Fig. 3

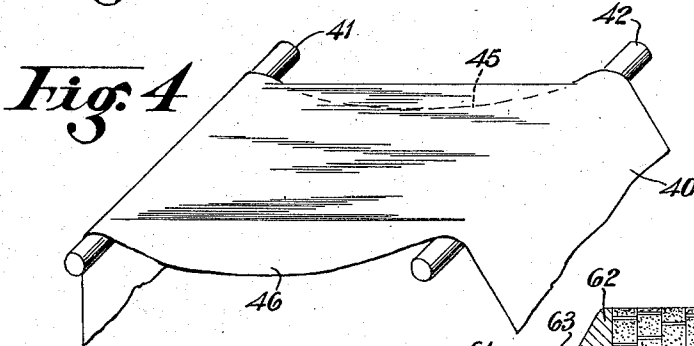


Fig. 4

Fig. 7

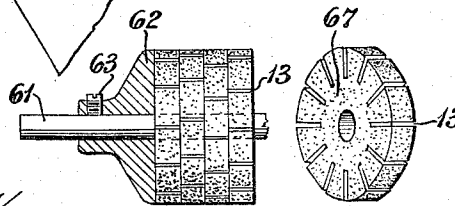
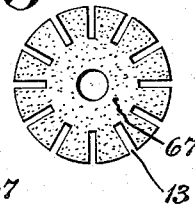


Fig. 6

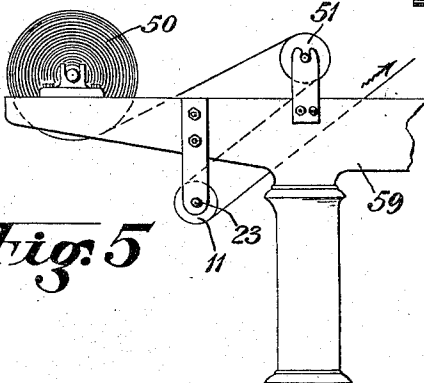


Fig. 5

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ROLLER HAVING SURFACE OF SPONGE RUBBER KNOBS

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14 Claims. (Cl. 271-2.1)

This invention relates to the handling of continuous webs of flexible sheet material, especially the smoothing out of regenerated cellulose film as it is fed to automatic machinery. More particularly it appertains to a type of idler roll, over which the web passes, which compensates for irregularities in the physical characteristics of the web so that it leaves the roll in a plane.

Wrapping machines, bag making machines, printing presses, slitting machines and like automatic machinery, are usually supplied with the sheet material, upon which they operate, in roll form. The rolls of stock, or mill rolls as they are commonly called, are frequently quite wide, and considerable difficulty is encountered in unwinding the sheet material and feeding it to the manipulative section of the machine. This is especially true of regenerated cellulose pellicle and the like. Manufacture and storage generally bring about non-uniformities which manifest themselves in sagging and floppiness of the unwound portion of such webs. Attempts to manipulate sheet material containing sagging portions causes folds, creases, wrinkles, poor alignment and the like, with resultant frequent jamming of the machinery and tearing of the web.

In the past a customary expedient has been to place the web under very high tension so that there is sufficient stretching to bring the sagging portions into the plane of the remainder of the web. This remedy gives results very little better than those obtained in its absence. The severe tension required causes frequent breaks and reduced durability in the manufactured products. The stretching of regenerated cellulose and other non-fibrous sheet material of similar character manifests itself later on in shrinkage. Such shrinkage frequently results in unattractive distortion and, if in a tight wrapping, can easily cause spontaneous rupture of the same.

The primary object of this invention was to provide a means of overcoming difficulties in the handling of continuous webs of thin sheet material caused by non-uniform physical dimensions. Further objects were to provide apparatus which would automatically correct or compensate for defects in flexible sheet wrapping material, and to provide a roll or guide member of such a construction that it would overcome defects in the running qualities of webs having uneven physical characteristics. A general advance in the art, and other objects which will appear hereinafter, are also contemplated.

It has now been found that the aforementioned objects may be accomplished, and the difficulties

of the prior art overcome, by passing the web material continuously around a roll surfaced with a number of very elastic cushions capable of movement in directions radial and tangential to the general surface contour of the roll. Such a roll may be applied to any automatic machine at very small expense and with little or no modification of the machine. When such a roll is employed, the web material, after it passes thereabout, leaves in a plane and has good running characteristics.

From the following description and specific example, in which are disclosed certain embodiments of the invention as well as details of what is believed to be the best mode for carrying out the invention, it will be apparent how the foregoing objects and related ends are accomplished. The written description is amplified by the accompanying drawing, in which:

Figure 1 is an isometric view of a cross-slotted sponge rubber roller;

Figure 2 is an end view partly in section of a similar roll mounted on a shaft;

Figure 3 is a plane view, partly in section, of the roll and shaft of Figure 2;

Figure 4 is an isometric view of a web of thin sheet material having a looseness or floppiness in its marginal portions;

Figure 5 is an elevation view, showing a mill roll of thin sheet material feeding over one of the slotted sponge rubber rolls into a machine utilizing the web material;

Figure 6 illustrates a modified form of roll; and

Figure 7 is a plan view of one sponge rubber disc unit of the roll of Figure 6.

The numeral 11 in Figures 1, 2, 3 and 5 indicates the corrective roll of the present invention. As will be obvious from the drawing, it is covered with a great number of sponge rubber blocks so that in general appearance it somewhat resembles an ear of corn. Its individual resilient knobs are shown at 12. The grooves or cuts which delineate the knobs are shown at 13. These grooves may be formed by molding or in any other suitable manner. Cutting the grooves after formation of the roll gives satisfactory results. In order to make the surface of the roll even softer, the pedestals of each of the knobs may be recessed so as to have a smaller cross-sectional area than the surface which contacts the web material. Individual knobs of this character resemble more or less a diabolo.

In Figure 4 the rods 41 and 42 support a stretched web of regenerated cellulose 40. This

web has poor "pull-out," as indicated by its sagging edge portions 45 and 46.

In Figure 5 a mill roll 50 in an automatic machine 59, feeds to the manipulative portion of a machine over a conventional dancer roll 51 and the resilient roll 11. The roller 51, which may be made of steel, aluminum, hardened plastic or the like, is incapable of supplying non-uniform web material to the succeeding portion of the machine in such a condition that it is taut throughout its width. The roll 11 levels off the sagging portions of such a web without stretching the sheet material undesirably. The pliability of the roll 11 permits compression enabling the tighter portions of the web to sink into its surface, thereby taking care of the unequalness or irregularity in dimension and physical properties. In order to get the greatest effect from the resilient surfaced roll, the web should pass therearound through an arc of at least 90°. Preceding conventional dancer rolls may be employed to alter the course of the web sufficiently to obtain the desired amount of contact.

In Figures 6 and 7 are shown rubber sponge discs 67 which, when mounted on a shaft or mandrel 61, form a modified type of roll. The discs are held in place on the mandrel by means of end pieces such as those shown at 62, which may conveniently be made of steel or its equivalent. A set screw 63 or equivalent means (such as a cotter pin) prevents lateral motion of the assembled roll on its shaft.

In the preferred embodiment of the invention, the sponge rubber roll material is formed and mounted on a tubular core 16. This enables the roll to be more readily positioned or located laterally on its shaft 23.

As one specific example, a roll consisting of a steel core of 2 inches outside diameter and 30 inches long and a layer of very soft resilient sponge rubber 1 inch thick adhered to the core, was produced by cutting the surface into blocks ½ inch square with longitudinal and circumferential grooves. The cuts extended approximately ⅞ inch in from the surface.

Designs other than squares, for example, rectangles, rhombuses, rhomboids and the like, may be desirable in specific cases. Diamond-shaped sections are quite satisfactory.

A web of regenerated cellulose having a thickness of 0.00088 inch, a width of 24 inches, and exhibiting a droop of approximately 2 inches at each margin when supported under a tension of 5 pounds between horizontal parallel hard surfaced supports placed 6 feet apart and perpendicular to the web's lengthwise dimension, when operated with the specific roll just described, is brought into a smoothly running web of plane contour when the same 5 pounds tension is present.

The roll functions satisfactorily at any of the operating speeds normally in use at present by automatic machinery handling such webs.

It is necessary that the outer portion of the corrective device of this invention be made of extremely resilient material in order to produce a roll with a surface sufficiently flexible and pliable to operate with webs at low tension. Sponge rubber is the preferred material. Special considerations such as cost, resistance to chemical action, and the like, make it desirable in some instances to use material other than rubber. Neoprene and other synthetic rubber-like materials are quite suitable. The resistance

of Neoprene to deterioration in the presence of oily substances, and its particular resilience characteristics, are well known.

Although the invention has been described in connection with the utilization of regenerated cellulose webs, it is to be understood that webs of other cellulosic materials, such as cellulose substitution derivatives like cellulose esters (for example, cellulose acetate), cellulose ethers (for example, methyl and ethyl cellulose) and cellulose ester ethers; rubber hydrochloride; paper; fabric; metal foils and the like, can be used.

The web, in passing around the roll, should make contact with as large a surface area as possible, in order to increase the corrective effect. Some correction will naturally be obtained even from slight angles of wrapping.

The corrective roll of this invention provides a simple and highly satisfactory solution of the problems involved in feeding webs of poor physical characteristics to machinery. The correction of, or compensation for, the non-uniform tension across the width of webs may now be obtained at operating tensions much lower than have heretofore been found possible. The poor guiding of web material through machines, flappiness, lack of registry in the machine and attendant difficulties, can now be completely and satisfactorily avoided. As a result of placing all portions of the web under similar low tension, the section of the web following the roll becomes a plane, and corrects defects such as lack of uniformity in physical characteristics or properties, for example, physical dimensions, stretch, elasticity, and change in physical dimensions with temperature and humidity variations. The disadvantages of undue deformation brought about in the prior art use of high tension are avoided.

As many apparently widely different embodiments of this invention may be made without departing from the spirit and scope thereof, it is to be understood that this invention is not limited to the specific embodiments thereof except as defined in the appended claims.

I claim:

1. In the feeding of continuous webs of thin, flexible sheet material to automatic machinery, the step of passing the webs around a resilient roller through an arc of at least 90° to smooth them out for the manipulative section of the machinery, said roller having a surface of sponge rubber knobs capable of movement radial and tangential to the roller surface to compensate for irregularities in the physical characteristics of the webs without the necessity of placing the webs under high tension.

2. In the feeding of continuous webs of thin, flexible, non-fibrous sheet material to automatic machinery, the step of passing the webs around a resilient roller through an arc of at least 90° to smooth them out for the manipulative section of machinery, said roller having a sponge rubber surface, said surface consisting of sponge rubber having circumferential and longitudinal slots delineating knobs capable of movement tangential to the roll surface.

3. In the feeding of continuous webs of thin, flexible, non-fibrous sheet material to automatic machinery, the step of passing the webs around a resilient roller through an arc of at least 90° to smooth them out for the manipulative section of machinery, said roller comprising a rigid steel core 30 inches long and 2 inches outside diameter and a soft resilient sponge rubber layer 1 inch thick adhered thereto, the surface of said sponge

rubber layer having longitudinal and circumferential grooves $\frac{7}{8}$ inch deep cutting the surface into squares having an area of 0.25 square inch.

4. The process of feeding a continuous web of regenerated cellulose to manipulative machinery, which comprises passing the web around a roller surfaced with soft, resilient sponge rubber through an arc of at least 90° to compensate for irregularities in the physical characteristics of the web, whereby the said web is smoothed out for entry to the manipulative section of the machinery without being placed under high tension, said roller having a surface of knobs formed by longitudinal and circumferential grooves, said knobs being capable of movement radial and tangential to the roller surface.

5. The process of feeding a continuous web of regenerated cellulose to manipulative machinery, which comprises passing the web around a roller surfaced with soft, resilient sponge rubber through an arc of at least 90° to compensate for irregularities in the physical characteristics of the web, whereby the said web is smoothed out for entry to the manipulative section of the machinery without being placed under high tension, said roller having a surface of knobs formed by longitudinal and circumferential grooves, said knobs having a surface area of 0.25 square inch and a height of $\frac{7}{8}$ inch, and being capable of movement radial and tangential to the roller surface in order to present continuous support for that portion of the web contiguous to the roller.

6. The process of feeding a continuous web of thin, flexible sheet material to manipulative machinery, which comprises passing the web around a roller surfaced with soft, resilient sponge rubber through an arc of at least 90° to compensate for irregularities in the physical characteristics of the web, whereby the said web is smoothed out for entry to the manipulative section of the machinery without being placed under high tension, said roller having a surface of knobs formed by longitudinal and circumferential grooves, said knobs being capable of movement radial and tangential to the roller surface.

7. The process of feeding a continuous web of thin, flexible sheet material to manipulative machinery, which comprises passing the web around a roller surfaced with soft, resilient sponge rubber through an arc of at least 90° to compensate for irregularities in the physical characteristics of the web, whereby the said web is smoothed out for entry to the manipulative section of the machinery without being placed under high tension, said roller having a surface of knobs, said knobs having a surface area of 0.25 square inch and a height of $\frac{7}{8}$ inch, and being capable of movement radial and tangential to the roller surface in order to present continuous support for that portion of the web contiguous to the roller.

8. The process of feeding a continuous web of non-fibrous, flexible, cellulosic material to manipulative machinery, which comprises passing the web around a roller surfaced with soft, resilient sponge rubber through an arc of at least 90° to compensate for irregularities in the physical characteristics of the web, whereby the said web is smoothed out for entry to the manipulative section of the machinery without being placed under high tension, said roller comprising a rigid steel core 30 inches long and 2 inches outside diameter and a soft resilient sponge rubber layer 1 inch thick adhered there-

to, the surface of said sponge rubber layer having longitudinal and circumferential grooves $\frac{7}{8}$ inch deep cutting the surface into squares having an area of 0.25 square inch.

9. The process of feeding a continuous web of flexible, non-fibrous material to manipulative machinery, which comprises passing the web around a roller surfaced with soft, resilient sponge rubber through an arc of at least 90° to compensate for irregularities in the physical characteristics of the web, whereby the said web is smoothed out for entry to the manipulative section of the machinery without being placed under high tension, said roller having a surface of knobs, said knobs having a surface area of 0.25 square inch and being capable of movement radial and tangential to the roller surface.

10. The process of feeding a continuous web of flexible, non-fibrous material to manipulative machinery, which comprises passing the web around a roller surfaced with soft, resilient sponge rubber through an arc of at least 90° to compensate for irregularities in the physical characteristics of the web, whereby the said web is smoothed out for entry to the manipulative section of the machinery without being placed under high tension, said roller having a surface of knobs, said knobs having a surface area of 0.25 square inch and a height of $\frac{7}{8}$ inch, and being capable of movement radial and tangential to the roller surface.

11. The process of feeding a continuous web of thin, flexible, non-fibrous sheet material to manipulative machinery, which comprises passing the web around a roller surfaced with soft, resilient sponge rubber through an arc of at least 90° to compensate for irregularities in the physical characteristics of the web, whereby the said web is smoothed out for entry to the manipulative section of the machinery without being placed under high tension, said roller having a surface of knobs formed by longitudinal and circumferential grooves, said knobs being capable of movement radial and tangential to the roller surface.

12. The process of feeding a continuous web of thin, flexible, non-fibrous regenerated cellulosic sheet material to manipulative machinery, which comprises passing the web around a roller surfaced with soft, resilient sponge rubber through an arc of at least 90° to compensate for irregularities in the physical characteristics of the web, whereby the said web is smoothed out for entry to the manipulative section of the machinery without being placed under high tension, said roller having a surface of knobs formed by longitudinal and circumferential grooves, said knobs being capable of movement radial and tangential to the roller surface.

13. The process of feeding a continuous web of regenerated cellulose film to manipulative machinery, which comprises passing the web around a roller surfaced with soft, resilient sponge rubber through an arc of at least 90° to compensate for irregularities in the physical characteristics of the web, whereby the said web is smoothed out for entry to the manipulative section of the machinery without being placed under high tension, said roller having a surface of knobs formed by longitudinal and circumferential grooves, said knobs being capable of movement radial and tangential to the roller surface.

14. The process of feeding a continuous web of regenerated cellulose film to manipulative machinery, which comprises passing the web around

a roller surfaced with soft, resilient sponge rubber through an arc of at least 90° to compensate for irregularities in the physical characteristics of the web, whereby the said web is smoothed out for entry to the manipulative section of the machinery without being placed under high tension, said roller comprising a rigid steel core 30

5 inches long and 2 inches outside diameter and a soft resilient sponge rubber layer 1 inch thick adhered thereto, the surface of said sponge rubber layer having longitudinal and circumferential grooves $\frac{1}{8}$ inch deep cutting the surface into squares having an area of 0.25 square inch.

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